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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:
Zhou Yang et al.

Serial No: 09/280,601

Filed: March 29, 1999

For: OPTICAL TERPOLYMER OF POLY-ISOCYANATE, POLYTHIOL AND POLYENE MONOMERS

GROUP ART UNIT: 1711

EXAMINER: Rabon Sergent

DATE: March 27, 2002

Commissioner of Patents and Trademarks
Washington, D.C. 20231

BRIEF FOR APPELLANTS

The subject patent application is a continuation application of U.S. Serial No. 08/425,958 filed on April 19, 1995, now U.S. Patent No. 6,008,296.

This is an appeal from the Final Rejection of the Examiner mailed October 16, 2001 rejecting claims 23-58 and 80-135. A Notice Of Appeal and the appeal fee were timely mailed and received in the United States Patent and Trademark Office on February 4, 2002. Please charge the Appeal fee of $310 for this brief and any over or under payment to Deposit Account No. 04-0566. Three copies of the brief are enclosed.

REAL PARTY IN INTEREST

The real party in interest is the assignee of all rights in this application, Optima Inc., a corporation of the State of Connecticut, having a place of business at 111 Research Drive, Stratford, Connecticut 06615.

RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences known to Appellants, Appellants' legal representatives, or assignee which will directly affect, or be affected by, or have a bearing on the Board's decision on this appeal.

STATUS OF CLAIMS

The subject application was filed on March 29, 1999 with claims 1-22, and a Preliminary Amendment adding claims 23-58. An Amendment was filed October 29, 1999 canceling claims 1-22 without prejudice and substituting therefor claims 59-78. Claim 79 was added as a substitution for canceled claim 64 in an amendment filed April 25, 2000. A Supplemental Amendment was filed June 8, 2000 adding claims 80-115. In an Amendment filed December 7, 2000, claims 59-63 and 64-79 were canceled and claims 116-135 substituted therefor. The Final Rejection Office Action mailed October 16, 2001 finally rejected all the claims in the application, to wit, 23-58 and 80-135, and Appellants are appealing the rejection of these claims.

As discussed hereinbelow, claims 23-58 and 80-115 are in the application to provoke an interference with Irizato et al. U.S. Patent No. 5,736,609.

STATUS OF AMENDMENTS

All the amendments added during prosecution of the application have been entered and are presently in the application. A summary of the rejection of the claims may be found in the Final Rejection Office Action mailed October 16, 2001.

SUMMARY OF THE INVENTION

Polymeric materials are used extensively as substitutes for glass in optical products such as lenses. The use of polymeric materials over glass offers several practical advantages. Since polymeric materials have a lower density than inorganic glass, there can be a great reduction in weight of the optical product.

Additionally polymeric materials may offer great improvement over glass in terms of impact resistance. The improved processability and other characteristics such as tintability make polymeric materials especially attractive as a material for ophthalmic lenses. A variety of polymeric materials including polycarbonates, polystyrenes, acrylic polymers, polythiourethane, and polysulfones have already been used for optical applications. Each of these materials offers a somewhat different combination of physical and optical properties which lead to advantages and disadvantages for optical applications. For example, polycarbonate lenses typically show excellent impact resistance but are also characterized by poor scratch resistance and tintability and high chromatic aberration. Acrylic polymers have excellent optical clarity, but poor impact resistance and a relatively low refractive index, but also show a great deal of optical dispersion combined with poor impact resistance. Polysulfones have a high refractive index, but are typically colored and typically difficult to process.

Considerable research has been directed towards development of polymers with a combination of properties which make them well suited for optical applications. Generally, a high refractive index is of principal importance for an optical material since the use of a high refractive index material allows for production of thinner lenses when designing lenses of the same power and design.

Reduction of edge thickness of the lens offers practical advantages in terms of weigh savings and aesthetic reasons. Another important consideration for optical materials is optical dispersiveness. The value of optical dispersiveness is typically characterized by the Abbe's number. Materials with high Abbe's numbers show little optical dispersiveness while materials with low Abbe's numbers show high optical dispersiveness. A high Abbe's number is desired for optical materials since this will lead to reduced chromatic aberration and better image clarity for a given lens design and thickness. Typically polymers with high refractive indices also possess low Abbe's numbers.

Appellants' invention is directed to optical terpolymers made by reacting monomers of a polyisocyanate or polyisothiocyanate, a polyene and a polythiol.

ISSUES

Claims 116, 117, 124-132, 134 and 135 have been rejected under 35 USC 112, first paragraph, as containing subject matter which the Examiner contends was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention.

Claims 23-58 and 80-115 have been rejected under 35 USC 112, first paragraph, as containing subject matter which the Examiner contends was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention.

Claims 121, 122, 133, 134, 135 have been rejected under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellants regard as the invention.

Claims 116-135 have been rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-24 of U.S. Patent No. 6,008,296.

GROUPING OF CLAIMS

Claims 23-58 and 80-115 stand or fall together.

Claims 116-135 stand or fall together.

ARGUMENT

I. Appellants' Initial Statement

The subject application is a continuation application of parent application Serial No. 08/425,958 filed on April 19, 1995, now U.S. Patent No. 6,008,296. In the parent application conflicting subject matter was indicated with U.S. Patent No. 5,736,609 ('609) issued April 7, 1998 to Irizato et al. and assigned to Mitsui Toatsu Chemicals, Inc. To overcome said conflicting claims, the claims in the parent application were amended to specifically exclude the type of polythiol monomer defined and claimed in the '609 patent.

Appellants have filed the subject application to copy all the claims of the '609 patent and the claims 23-58 added in the Preliminary Amendment for the subject application correspond exactly to claims 1-36 of the '609 patent. Claims 80-115 claim a specific embodiment (X, Y, Z are all 0) of the '609 patent. Further, the

original claims 1-22 of the parent application were continued in the subject continuation application and after amendment are now claims 116-135.

II. Rejection of Claims 116, 117, 124-132, 134 and 135 Under 35 USC 112, First Paragraph

Claims 116, 117, 124-132, 134 and 135 have been rejected under 35 USC 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors at the time the application was filed had possession of the claimed invention. Specifically, the Examiner contends that Appellants have failed to indicate where support exists for stating that the polyene contains only vinyl functional groups. In the parent application it is noted that the language was specified with a structural formula for the polyene which contains only vinyl functional groups. It is respectfully submitted that the claims are properly allowable under 35 USC 112, first paragraph.

If a claim whose language is clear and whose scope is understandable is so broad it exceeds the scope of the enabling disclosure of the specification, the claim is based on insufficient disclosure and should be rejected under 35 USC 112, first paragraph. *In re Borkowski et al.* (CCPA 1970) 164 USPQ 642. The reason a claim which is broader than the invention described in the specification should be rejected under 35 USC 112, first paragraph, is that a breadth rejection of this type is really an assertion that the specification is insufficient to support the claims. *In re Wakefield et al.* (CCPA 1970) 164 USPQ 626. It should be appreciated however that the first paragraph of 35 USC 112 requires nothing more than objective enablement. Whether this is achieved by the use of illustrative examples or by

broad terminology is of no importance. *In re Marzocchi et al.* (CCPA 1971) 169 USPQ 367. An assertion by the PTO that the enabling disclosure is not commensurate in scope with the protection sort must be supported by evidence or reasoning substantiating the doubts so expressed. *In re Armbruster* (CCPA 1975) 185 USPQ 152. In order to be entitled to the benefit thereof, it is not necessary that a parent application exactly describe the limitations of the a claimed process but need only to so clearly enough that those skilled in the art would recognize from the disclosure that Appellants invented the claimed process including those limitations. *In re Werthein et al.* (CCPA 1976) 191 USPQ 90. The public purpose on which the patent laws rest requires the granting of claims commensurate in scope with the disclosed invention. This requires granting broad claims for broad inventions as well as more specific claims for inventions. It is neither contemplated by the public purpose of the patent laws nor required by the statute that an inventor shall be forced to accept claims narrower than in his invention in order to secure allowance of his patent. *In re Sus et al.* (CCPA 1962) 134 USPQ 301.

Breadth alone is not indefiniteness. *In re Gardner et al.* (CCPA 1970) 166 USPQ 138. A broad claim which employs well-known language conventionally used in the art to which the invention pertains and which is of the same scope as the description of the invention as stated in the disclosure is not objectionable under the second paragraph, 35 USC 112, since it neither "too" broad in the sense of embracing a concept not stated in the original disclosure or is it vague or indefinite. *In re Kamal et al.* (CCPA 1968) 158 USPQ 320. It is also established patent law that the mere fact that routine experimentation might be required to determine whether any particular embodiment of a class of compounds will be useful as an ingredient

of the claimed composition alone is not sufficient reason to deny claims to a composition which recited the class broadly. *Atlas Powder Co. v. E.I. DuPont DeNemours & Co.* (CAFC 1984) 224 USPQ 409.

Applying the patent law to the facts of the subject patent application it is respectfully submitted that the claims are properly allowable under 35 USC 112, first paragraph. In the summary of the invention on page 4, the paragraph beginning at line 33, it is stated that it has been discovered that reacting effective amounts of polythiols with both polyenes, preferably with three or higher number of vinyl groups in the monomers, and polyisocyanates results in a new class of terpolymers. On page 5, starting at line 9, a polyene monomer is defined as a compound containing two or more vinyl groups. A polyene monomer is further defined in the paragraph beginning at line 30 on page 7 and typical examples of polyene monomers are provided on page 8, the paragraph beginning at line 3. Exemplary polyene monomers include those which contain only vinyl functional groups. In the examples set forth on pages 16-18 all the polyene monomers used as component C contain only vinyl groups. It is thus respectfully submitted that Appellants did in fact have possession of the claimed invention and that the claims are properly allowable under 35 USC 112.

III. Rejection of Claims 23-58 and 80-115 under 35 USC 112, First Paragraph

Claims 23-58 and 80-115 have been rejected under 35 USC 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor at the time that the application was filed had possession of the claimed invention. Specifically, the Examiner contends that support is not shown for the

range of polythiol compounds represented by formula 1 in claims 23, 27, and 55. Further, it is also contended that clear support has not been found for the terminology "neither a hydroxyl group nor a mercapto group" in claims 23, 27, 55, 80, 84 and 112. Lastly, it is also contended that support has not been found for the ratio range of claims 26, 30, 83, and 87. It is respectfully submitted that claims 23-58 and 80-115 have support in the specification under 35 USC, 112, first paragraph.

The subject invention is based on the discovery of forming optical terpolymers by reacting polythiols, polyenes and polyisocyanates.

One of the polythiol monomers specifically identified in the application is 1,2,3-propanetrithiol. This compound falls within formula (1) of claims 23 and 80 and shows that such polythiols are contemplated in the subject patent application.

Likewise, with regard to the polymer compound having neither a hydroxyl group nor a mercapto group, in the specification there was disclosed a number of polyene compounds which do not contain a hydroxyl group nor a mercapto group. Specifically, 1,6-hexane-diacrylate or dimethacrylate and pentaerythritol triacrylate or trimethacrylate and pentaerythritol tetraacreylate or tetramethacrylate as well as other polyenes set forth therein. Accordingly, a number of compounds are disclosed which encompass polyenes containing neither a hydroxyl group nor a mercapto group.

With regard to the ratio range of claims 26, 30, 83 and 87 on page 11, column 13-20 of the subject application, the proportion of the monomers are indicated to range widely depending on the polymer properties desired. The ratio of NCO or NCS groups and vinyl groups to -SH groups is preferably in the range of 1.05 to 2.0 which includes the '609 patent range of 1.0 to 3.0.

The Board's attention is directed to Appellants' statement of the patent law as above in II for support for Appellants' position.

IV. Rejection of Claims 121, 122 and 133-135 under 35 USC 112, Second Paragraph

Claims 121-122 and 133 have been rejected under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellants regard as the invention. Specifically, use of "and" and "or" within the Markush group language of claim 121 is considered to render the claims indefinite. Appellants acknowledge the improper Markush group and will make the necessary amendments to correct the error when allowable subject matter is indicated.

Claims 134 and 135 have been rejected under 35 USC 112, second paragraph, as being indefinite for failing to particularly point and distinctly claim the subject matter which Appellants regard as the invention. Specifically, Appellants have claimed a curable monomer composition and the Examiner contends that it is unclear that the polymerization language refers to producing the terpolymer and that it is unclear that claim 134 is directed to anything other than the monomer composition. Also, claim 134 is confusing because it specifies that the composition of claim 116 is in solution but the claim states that this solution is bulk polymerized.

Claim 134 defines a curable monomer composition as consisting essentially of the composition of claim 116 which is in solution in a solvent and which solution is then polymerized and an elevated temperature to form the terpolymer. Appellants acknowledge that bulk polymerization excludes compositions in solution and will amend the claim to correct this error when allowable subject matter is

indicated. Likewise, Appellants acknowledge that claim 134 directed to a monomer composition which is in solution is a solvent.

It is respectfully submitted that the claims are properly allowable under 35 USC 112.

V. Rejection of Claims 116-135 Under Double Patenting

Appellants will file a Terminal Disclaimer when allowable subject matter is indicated. Optima Inc., the real party in interest, is the assignee of conflicting U.S. Patent No. 6,008,296.

SUMMARY

Accordingly, for the reasons given above, Appellants respectfully submit that the claimed invention is proper under 35 USC 112, first and second paragraphs. The final rejection should be reversed and the claims should be allowed to issue and an interference declared with U.S. Patent No. 5,736,609.

Respectfully submitted,

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service on the date indicated below as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231

Name: Carol M. Thomas **Date:** March 27, 2002 **Signature:**

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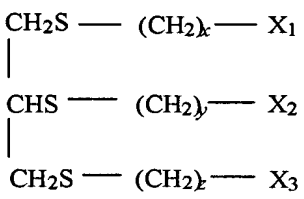
APPENDIX A

Rejected Claims of Serial No. 09/280,601

23. A sulfur-containing urethane resin composition which comprises a polythiol compound represented by formula (1):



(1)

wherein X_1, X_2 and X_3 each is a hydrogen atom or a mercapto group; x, y and z each is an integer of 0 to 8; and in their combinations, formula (1) has at least two mercapto groups,

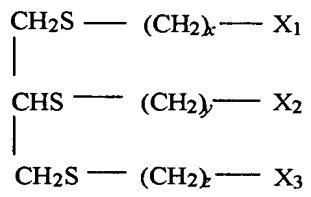
a polyiso(thio)cyanate compound, and a compound having two or more reactive unsaturated groups and neither a hydroxyl group nor a mercapto group in an amount of 30 to 70% by weight based on the total weight of the composition.

24. The sulfur-containing urethane resin composition according to claim 23 wherein the amount of the compound having two or more reactive unsaturated groups is in the range of 30 to 50% by weight based on the total weight.

25. The sulfur-containing urethane-based resin composition according to claim 23 which contains another polythiol compound or a thiol compound having a hydroxyl group in addition to the polythiol of formula (1).

26. The sulfur-containing urethane resin composition according to claim 25 wherein the polyiso(thio)cyanate compound, the compound having the reactive unsaturated groups, the polythiol of formula (1), and the other polythiol compound or the thiol compound having the hydroxyl group is such that a functional group molar ratio of {the iso(thio)cyanate group +the reactive unsaturated group }/{ the mercapto group +the hydroxyl group } is in the range of 1.0 to 3.0.

27. A sulfur-containing urethane resin composition which comprises a polythiol compound represented by formula (1):



(1)

wherein X_1, X_2 and X_3 each is a hydrogen atom or a mercapto group; x, y and z each is an integer of 0 to 8; and in their combinations, formula (1) has at least two mercapto groups,

a polyiso(thio)cyanate compound, and a compound having two or more reactive unsaturated groups and neither a hydroxyl group nor a mercapto group in an amount of 10 to 70% by weight based on the total weight of the composition, and a photopolymerization catalyst.

28. The sulfur-containing urethane resin composition according to claim 27 wherein the amount of the compound having two or more reactive unsaturated groups is in the range of 30 to 50% weight based on the total weight.

29. The sulfur-containing urethane resin composition according to claim 27 which contains another polythiol compound or a thiol compound having a hydroxyl group in addition to the polythiol of formula (1).

30. The sulfur-containing urethane resin composition according to claim 29 wherein the polyiso(thio)cyanate compound, the compound having the reactive unsaturated groups, the polythiol of formula (1) and the other polythiol compound or the thiol compound having the hydroxyl group is such that a functional group molar ratio of {the iso(thio)cyanate group +the reactive unsaturated group }/{ the mercapto group +the hydroxyl group } is in the range of 1.0 to 3.0.

31. A sulfur-containing urethane resin obtained by polymerizing the composition of claim 23.

32. A sulfur-containing urethane resin obtained by polymerizing the composition of claim 24.

33. A sulfur-containing urethane resin obtained by polymerizing the composition of claim 25.

34. A sulfur-containing urethane resin obtained by polymerizing the composition of claim 26.

35. A sulfur-containing urethane resin obtained by polymerizing the composition of claim 27.

36. A sulfur-containing urethane resin obtained by polymerizing the composition of claim 28.

37. A sulfur-containing urethane resin obtained by polymerizing the composition of claim 29.

38. A sulfur-containing urethane resin obtained by polymerizing the composition of claim 30.

39. An optical element which comprises the resin of claim 31.

40. An optical element which comprises the resin of claim 32.

1 41. An optical element which comprises the resin of claim 33.

1 42. An optical element which comprises the resin of claim 34.

1 43. An optical element which comprises the resin of claim 35.

1 44. An optical element which comprises the resin of claim 36.

1 45. An optical element which comprises the resin of claim 37.

1 46. An optical element which comprises the resin of claim 38.

1 47. A lens which comprises the optical element of claim 39.

1 48. A lens which comprises the optical element of claim 40.

1 49. A lens which comprises the optical element of claim 41.

1 50. A lens which comprises the optical element of claim 42.

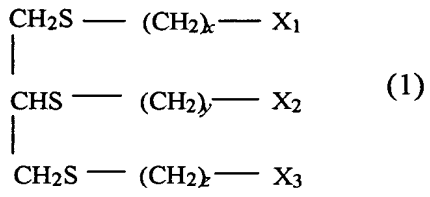
1 51. A lens which comprises the optical element of claim 43.

52. A lens which comprises the optical element of claim 44.

53. A lens which comprises the optical element of claim 45.

54. A lens which comprises the optical element of claim 46.

55. A process for preparing a sulfur-containing urethane resin which comprises a step of curing by irradiating UV rays or visible rays a sulfur-containing urethane resin composition comprising a polythiol compound represented by formula (1):



(1)

wherein X_1, X_2 and X_3 each is a hydrogen atom or a mercapto group; x, y and z each is an integer of 0 to 8; and in their combinations, formula (1) has at least two mercapto groups,

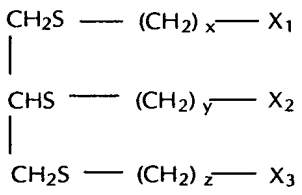
a polyiso(thio)cyanate compound, and a compound having two or more reactive unsaturated groups and neither a hydroxyl group nor a mercapto group in an amount of 10 to 70% by weight based on the total weight of the composition.

56. A sulfur-containing urethane resin which is obtained by the process of claim 55.

57. An optical element which comprises the resin of claim 56.

58. A lens which comprises the optical element of claim 57.

80. A sulfur-containing urethane resin composition which comprises a polythiol compound represented by formula (1):



(1)

wherein X_1, X_2 and X_3 each is a hydrogen atom; and

x, y and z each is 0;

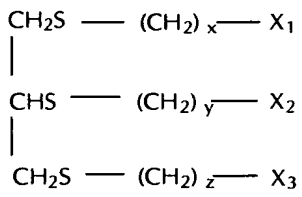
a polyiso(thio)cyanate compound, and a compound having two or more reactive unsaturated groups and neither a hydroxyl group nor a mercapto group in an amount of 30 to 70% by weight based on the total weight of the composition.

81. The sulfur-containing urethane resin composition according to claim 80 wherein the amount of the compound having two or more reactive unsaturated groups is in the range of 30 to 50% by weight based on the total weight.

82. The sulfur-containing urethane-based resin composition according to claim 80 which contains another polythiol compound or a thiol compound having a hydroxyl group in addition to the polythiol of the formula.

83. The sulfur-containing urethane resin composition according to claim 82 wherein the polyiso(thio)cyanate compound, the compound having the reactive unsaturated groups, the polythiol of the formula, and the other polythiol compound or the thiol compound having the hydroxyl group is such that a functional group molar ratio of {the iso(thio)cyanate group +the reactive unsaturated group }/{ the mercapto group +the hydroxyl group } is in the range of 1.0 to 3.0.

84. A sulfur-containing urethane resin composition which comprises a polythiol compound represented by formula (1):



(1)

wherein X_1, X_2 and X_3 each is a hydrogen atom; and x, y and z each is 0; a polyiso(thio)cyanate compound, and a compound having two or more reactive unsaturated groups and neither a hydroxyl group nor a mercapto group in an amount of 10 to 70% by weight based on the total weight of the composition, and a photopolymerization catalyst.

85. The sulfur-containing urethane resin composition according to claim 84 wherein the amount of the compound having two or more reactive unsaturated groups is in the range of 30 to 50% weight based on the total weight.

86. The sulfur-containing urethane resin composition according to claim 84 which contains another polythiol compound or a thiol compound having a hydroxyl group in addition to the polythiol of the formula.

87. The sulfur-containing urethane resin composition according to claim 86 wherein the polyiso(thio)cyanate compound, the compound having the reactive unsaturated groups, the polythiol of the formula and the other polythiol compound or the thiol compound having the hydroxyl group is such that a functional group molar ratio of {the iso(thio)cyanate group +the reactive unsaturated group }/{ the mercapto group +the hydroxyl group } is in the range of 1.0 to 3.0.

88. A sulfur-containing urethane resin obtained by polymerizing the composition of claim 80.

89. A sulfur-containing urethane resin obtained by polymerizing the composition of claim 81.

90. A sulfur-containing urethane resin obtained by polymerizing the composition of claim 82.

91. A sulfur-containing urethane resin obtained by polymerizing the composition of claim 83.

92. A sulfur-containing urethane resin obtained by polymerizing the composition of claim 84.

93. A sulfur-containing urethane resin obtained by polymerizing the composition of claim 85.

94. A sulfur-containing urethane resin obtained by polymerizing the composition of claim 86.

95. A sulfur-containing urethane resin obtained by polymerizing the composition of claim 87.

96. An optical element which comprises the resin of claim 88.

97. An optical element which comprises the resin of claim 89.

98. An optical element which comprises the resin of claim 90.

99. An optical element which comprises the resin of claim 91.

1 100. An optical element which comprises the resin of claim 92.

1 101. An optical element which comprises the resin of claim 93.

1 102. An optical element which comprises the resin of claim 94.

1 103. An optical element which comprises the resin of claim 95.

1 104. A lens which comprises the optical element of claim 96.

1 105. A lens which comprises the optical element of claim 97.

1 106. A lens which comprises the optical element of claim 98.

1 107. A lens which comprises the optical element of claim 99.

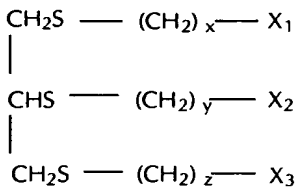
1 108. A lens which comprises the optical element of claim 100.

1 109. A lens which comprises the optical element of claim 101.

1 110. A lens which comprises the optical element of claim 102.

111. A lens which comprises the optical element of claim 103.

112. A process for preparing a sulfur-containing urethane resin which comprises a step of curing by irradiating UV rays or visible rays a sulfur-containing urethane resin composition comprising a polythiol compound represented by formula (1):



(1)

wherein X_1, X_2 and X_3 each is a hydrogen atom; and x, y and z each is 0; a polyiso(thio)cyanate compound, and a compound having two or more reactive unsaturated groups and neither a hydroxyl group nor a mercapto group in an amount of 10 to 70% by weight based on the total weight of the composition.

113. A sulfur-containing urethane resin which is obtained by the process of claim 112.

114. An optical element which comprises the resin of claim 113.

115. A lens which comprises the optical element of claim 114.

116. A monomer composition characterized by being curable and which is cured by reacting the composition at an elevated temperature to form a homogeneous terpolymer resin of the monomer composition which terpolymer has a single glass transition temperature, does not have any phase separation and is optically clear consisting essentially of:

a first monomer represented by the formula:

$$R(NCY)x$$

wherein R is a hydrocarbon or substituted hydrocarbon radical, Y is oxygen or sulfur and x is two or more;

a second polyene monomer wherein the polyene contains only vinyl functional groups; and

a third polythiol monomer.

117. The composition of claim 116 wherein Y is oxygen.

118. The composition of claim 117 wherein the polyene is represented by the formula:

$$[CH_2 = CR_1\text{–}CO\text{–}A\text{–}]_y \quad R_2$$

wherein R_1 is H or CH_3; A is oxygen, sulfur, or NH; R_2 is a polyvalent aliphatic, alicyclic or aromatic hydrocarbon residue, and y is 2-6.

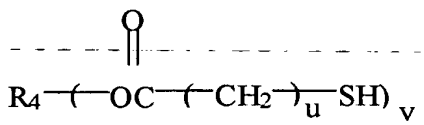
119. The composition of claim 118 wherein the polyisocyanate monomer is an aromatic diisocyanate.

120. The composition of claim 119 wherein the polyene monomer is a tri, or tetraacrylate compound.

121. The composition of claim 120 wherein the polythiol monomer is selected from the group consisting of a compound represented by the formula:

$$HB–R3–(BH)z$$

wherein R_3 is an organic group selected from the group consisting of polyvalent aliphatic or alicyclic and aromatic hydrocarbon, z is an integer of 1 to 3, and B is S; and



wherein R_4 is a substituted or unsubstituted aliphatic polyhydric alcohol residue, u is an integer of 1 or 2, and v is an integer of 2 to 4.

122. The composition of claim 121 wherein the polyisocyanate is m-xylylene diisocyanate, the polyene is pentaerythritol tetraacrylate, and the polythiol is selected from the group consisting of pentaerythritol tetrakis(2-mercaptoacetate), 1,2-ethanedithiol and mixtures thereof.

123. The composition of claim 116 wherein the polyene is triallyl-1,3, 5-triazine-2,4,6(1H, 3H, 5H)-trione.

124. A process for making homogeneous terpolymer resins which terpolymers have a single glass transition temperature, do not have any phase separation and which are optically clear comprising reacting at an elevated temperature a curable composition consisting essentially of the composition of claim 116.

125. The process of claim 124 wherein the monomers are admixed under non-reactive conditions.

126. The process of claim 124 wherein the monomers are admixed at a temperature of room temperature or below.

127. The process of claim 126 wherein an initiator and a reaction catalyst are added to the composition.

128. The process of claim 127 wherein the initiator is 1,1'-azobis(cyclohexanecarbonitrile) and a reaction catalyst is dibutyltindilaurate or tributylamine.

129. The process of claim 124 wherein the composition is cured by heating the composition to a first temperature of about 0° to 60°C, then heating the composition gradually to a second temperature of about 100 to 150°C over a period of about 1 to 32 hours, maintaining the composition at the second temperature for about 4 to 32 hours, then cooling the composition to a third temperature of about 20 to 40°C over a period of about 1 to 32 hours.

130. The composition of claim 116 wherein photochromic materials are used to provide a tinted optical product.

131. The composition of claim 130 wherein the photochromic materials are naphthopyran compounds, spiro compounds or indoline compounds.

132. A terpolymer product made by polymerizing the composition of claim 116.

133. A polymer product made by polymerizing the composition of claim 121.

134. A curable monomer composition for making a linear homogeneous terpolymer which terpolymer has a single glass transition temperature, does not have any phase separation and which is optically clear consisting essentially of the composition of claim 116 in solution in a solvent and which solution is

polymerized or bulk polymerized at an elevated temperature to form the terpolymer.

135. A linear terpolymer product made by polymerizing the composition of claim 134.